

What Is Claimed Is:

1. An apparatus, comprising:

a die having a plurality of contacts;

5 a substrate having a plurality of contact pads;

a plurality of bumps formed on one of said contacts and contact pads;

a plurality of pockets formed on other of said contacts and contact pads; and

the bumps and pockets forming a covalently bonded structure.

2. The apparatus of claim 1, wherein said bumps being formed from a polymer.

10 3. A method, comprising:

forming a conductive bump on one of a die and a substrate;

forming a non-conductive pocket on the other of said die and substrate; and

contacting the bump with the non-conductive pocket; and

15 curing the bump and the non-conductive pocket to form a covalently bonded laminate structure.

4. The method of claim 3, wherein said step of forming the conductive bump includes forming the bump using a polymer.

5. A flip chip apparatus, comprising:

20 a die including a plurality of bumps initially formed from partially-cured electrically conductive polymer materials;

a substrate including a plurality of contact pads, and a film, initially formed from partially-cured electrically non-conductive materials, surrounding each contact pad such as to expose the contact pads; and

the bumps and non-conductive film forming a covalently bonded laminate structure.

6. The apparatus of claim 5, wherein the bumps and the film being formed from materials allowing control of the degree of latency of the bumps and the film.

5 7. The apparatus of claim 6, wherein the materials include benzocyclobutene.

8. The apparatus of claim 5, wherein the covalently bonded structure being formed of materials having equivalent coefficients of thermal expansion.

9. The apparatus of claim 5, wherein the pattern of bumps on the die correspond to the pattern of contact pad openings on the substrate.

10 10. A flip chip apparatus, comprising:

a substrate including a plurality of partially-cured electrically conductive polymer bumps;

a die including a plurality of contact pads, and partially-cured electrically non-conductive film surrounding each contact pad such as to expose the contact pads; and

15 the bumps and non-conductive film forming a covalently bonded laminate structure.

11. The apparatus of claim 10, wherein the bumps and the film being formed from materials allowing control of the degree of latency of the bumps and the film.

12. The apparatus of claim 11, wherein the materials include benzocyclobutene.

20 13. A flip chip apparatus, comprising:

a die including a contact pad surrounded by a collar, the collar being initially formed from partially-cured, non-electrically conductive materials, and a bump being formed that extends out of the collar;

a substrate including a plurality of contact pads, and a film, initially formed from partially-cured electrically non-conductive materials, surrounding each contact pad such as to expose the contact pads; and

the collar and non-conductive film forming a covalently bonded laminate
5 structure.

14. The apparatus of claim 13, wherein the collar and the film being formed from materials allowing control of the degree of latency of the collar and the film.

15. The apparatus of claim 13, wherein the bump being formed from one of benzocyclobutene, electroplated solder, stencil printed solder, and electrically conductive
10 paste.

16. A flip chip apparatus, comprising:

a die including a contact pad and a bump, initially formed from partially-cured electrically conductive or partially-cured non-conductive polymer materials, separated from the contact pad;

15 a substrate including a plurality of contact pads, and a film, initially formed from partially-cured electrically non-conductive materials, surrounding each contact pad such as to expose the contact pads; and

the bumps and non-conductive film forming a covalently bonded laminate
structure.

20 17. The apparatus of claim 16, wherein the bump and the film being formed from materials allowing control of the degree of latency of the bump and the film.

18. A method for making a flip chip apparatus, comprising:

forming a plurality of electrically conductive polymer bumps on one of a die and

a substrate;

forming an electrically non-conductive film around each of a plurality of contact pads on other of said die and substrate;

partially curing the bumps and the film; and

5 contacting the bumps with the contact pads, and curing the bumps and the non-conductive film to form a covalently bonded laminate structure.

19. The method of claim 18 wherein the bumps and the film being formed from materials allowing control of the degree of latency of the bumps.

20. The method of claim 18, wherein the materials include benzocyclobutene.

10 21. The method of claim 18, wherein the covalently bonded structure being formed of materials having equivalent coefficients of thermal expansion.

22. The method of claim 18, wherein said step of forming the polymer bumps includes forming the bumps using one of spin coating and stencil printing.

23. An electrically conductive paste, comprising:

15 benzocyclobutene; and

filler particles dispersed in the benzocyclobutene.

24. The electrically conductive paste of claim 23, wherein the particles are one of spherical particles and irregularly shaped particles.

25. A method for forming an electrically conductive paste, comprising:

20 forming benzocyclobutene; and

dispersing filler particles within the benzocyclobutene.

26. The method of claim 25, further comprising:

forming a bump using the benzocyclobutene dispersed with filler particles on one of a die and substrate.

27. The method of claim 25, wherein said step of forming the bump includes forming the bump by one of stencil printing and spin-coating.